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CLAIMS

[Claim(s)]
[Claim 1] A sealant is applied in general to either [at least] the 1st substrate or the 2nd substrate in the shape of a frame. A liquid crystal constituent is dropped inside the sealant applied in the shape of a frame. Said 2nd substrate to said 1st substrate Superposition, In the manufacture approach of the liquid crystal display which encloses a liquid crystal constituent with the predetermined gap between the substrates of a couple, and hardens a sealant by pressurizing The manufacture approach of the liquid crystal display characterized by the solubility to the liquid crystal constituent of said sealant being 100 ppm or less in between before hardening, after applying said sealant.
[Claim 2] The sealant characterized by the solubility to the liquid crystal constituent of said sealant being 100 ppm or less in the sealant which contacts lamination and a liquid crystal constituent and is used in the 1st substrate and the 2nd substrate.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the manufacture approach of the sealant for liquid crystal displays, and a liquid crystal display, and relates to the manufacture approach of the liquid crystal display which encloses a liquid crystal constituent especially for a short time.
[0002]
[Description of the Prior Art] In recent years, the liquid crystal display is used in various fields taking advantage of the description of a light weight, a thin shape, and a low power. Especially the liquid crystal display with which it comes to hold the Twisted Nematic (TN) mold liquid crystal constituent between the electrode substrates of a couple is used widely.
[0003] As an approach of arranging a liquid crystal constituent between the substrates of a couple, the vacuum pouring-in method and the dropping pouring-in method are learned, for example.
[0004] By the vacuum pouring-in method, after sticking two glass substrates first by the sealant which consists of adhesives, a sealant is hardened and an empty liquid crystal cell is formed. At this time, a sealant is applied except for the part equivalent to a liquid crystal inlet. Then, an empty liquid crystal cell is put in into a vacuum chamber, the interior is changed into a reduced pressure condition, and the air in a liquid crystal cell is exhausted. And after dipping a liquid crystal inlet in the boat containing a liquid crystal constituent, by returning the inside of a vacuum chamber to an atmospheric pressure, from a liquid crystal inlet, a liquid crystal constituent is inhaled and it is filled up according to the difference of the internal atmospheric pressure of a liquid crystal cell, and the atmospheric pressure in a vacuum chamber.
[0005] By this vacuum pouring-in method, about 7 thru/or the long duration of about 10 hours are required to also pour in a general-purpose positive type liquid crystal constituent, and in panel size's becoming large, or a cel gap's becoming small or pouring in negative-mold liquid crystal constituents, such as MVA, there is a problem which requires long duration further.
[0006] On the other hand, after applying a sealant to one substrate in the shape of a frame by the dropping pouring-in method as known for JP,61-260216,A etc., it is the approach of trickling a liquid crystal constituent within the limit on a substrate, piling up the substrate of another side in a vacuum, and sticking. In order to form a desired cel gap between the substrates of a couple, it is necessary to leave it in atmospheric air, and to pressurize with atmospheric pressure, or to pressurize mechanically.
[0007] It is possible to form a liquid crystal layer in a short time of about 1 hour in this dropping pouring-in method irrespective of the property of panel size, a cel gap, and the liquid crystal constituent to be used.
[0008]
[Problem(s) to be Solved by the Invention] However, there are the following problems in such a dropping pouring-in method. That is, in order to contact a liquid crystal constituent before a sealant hardens, the component of a sealant will begin to melt into a liquid crystal constituent, a liquid crystal constituent will be polluted, and, thereby, the problem of causing a poor display arises.

[0009] For this reason, according to JP,5-265012,A, JP,8-190099,A etc., the method of stiffening the front face of the sealant which contacts a liquid crystal constituent before dropping of a liquid crystal constituent is proposed. Moreover, according to JP,11-109388,A etc., before a liquid crystal constituent contacts breadth and a sealant, the method of stiffening a sealant is also proposed.
[0010] However, a sealant cannot be crushed easily and they has the problem that a desired cel gap is not securable in order to harden a sealant before pressurizing each of these approaches so that it may consider as the cel gap of a request of a liquid crystal layer. For this reason, the problem that it is stabilized and the good liquid crystal display of display grace cannot be produced to a large quantity arises.
[0011] This invention is made in view of the trouble mentioned above, and that object is in offering the sealant applied to the manufacture approach of the liquid crystal display which it is stabilized and can mass-produce the good liquid crystal display of display grace possible [enclosing a liquid crystal constituent for a short time], and this liquid crystal display.
[0012]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem and to attain the object, the manufacture approach of a liquid crystal display according to claim 1 A sealant is applied in general to either [at least] the 1st substrate or the 2nd substrate in the shape of a frame. A liquid crystal constituent is dropped inside the sealant applied in the shape of a frame. Said 2nd substrate to said 1st substrate Superposition. In the manufacture approach of the liquid crystal display which encloses a liquid crystal constituent with the predetermined gap between the substrates of a couple, and hardens a sealant by pressurizing After applying said sealant, before hardening, in between, it is characterized by the solubility to the liquid crystal constituent of said sealant being 100 ppm or less.
[0013] A sealant according to claim 2 is characterized by the solubility to the liquid crystal constituent of said sealant being 100 ppm or less in the sealant which contacts lamination and a liquid crystal constituent and is used in the 1st substrate and the 2nd substrate.
[0014]
[Embodiment of the Invention] Hereafter, the gestalt of 1 operation of the sealant applied to the manufacture approach of the liquid crystal display this invention and this liquid crystal display is explained with reference to a drawing.
[0015] The liquid crystal display concerning the gestalt of implementation of this invention is equipped with the liquid crystal display panel (liquid crystal cell) 10 with the liquid crystal layer 300 containing the liquid crystal constituent held at the predetermined gap between the array substrate (the 1st substrate) 100, the opposite substrate (the 2nd substrate) 200 by which set predetermined spacing and opposite arrangement was carried out to the array substrate 100, and the array substrate 100 and the opposite substrate 200 as shown in drawing 1 and drawing 2 .
[0016] In such a liquid crystal display panel 10, the viewing area 102 which displays an image is formed in the field surrounded by the rim seal member 106 which sticks the array substrate 100 and the opposite substrate 200. The boundary region 104 which has wiring pulled out out of the viewing area 102, an actuation circuit, current supply wiring, etc. is formed in the field of the outside of the rim seal member 106.
[0017] In a viewing area 102 the array substrate 100 The m scanning lines Y1-Ym formed along with the line writing direction of the pixel electrode 151 of the mxn individual arranged in the shape of a matrix, and these pixel electrode 151 as shown in drawing 2 , n signal lines X1-Xn formed along the direction of a train of these pixel electrode 151, It has, the thin film transistor TFT121, i.e., the pixel, of a mxn individual arranged as a switching element corresponding to the pixel electrode 151 of a mxn individual near the crossover location of the scanning lines Y1-Ym and signal lines X1-Xn.
[0018] Moreover, in the boundary region 104, the array substrate 100 has the scanning-line actuation circuit 18 which drives the scanning lines Y1-Ym, the signal-line actuation circuit 19 which drives signal lines X1-Xn. These scanning-lines actuation circuit 18 and the signal-line actuation circuit 19 are constituted by the circuit of the complementary type which consists of an n channel mold thin film transistor and a P channel mold thin film transistor. These thin film

transistors are for example, top gate mold thin film transistors which make a polish recon thin film a barrier layer.
[0019] As shown in drawing 2 , the liquid crystal capacity CL is formed of the pixel electrode 151, a counterelectrode 204, and the liquid crystal layer 300 pinched by inter-electrode [these]. Moreover, the auxiliary capacity Cs is formed in juxtaposition at the liquid crystal capacity CL and an electric target. This auxiliary capacity Cs is formed by the electrode of the couple by which opposite arrangement was carried out through the insulating layer, i.e., the pixel electrode 151 and the auxiliary capacity electrode 61 of same electric potential, and the auxiliary capacity line 52 set as predetermined potential. The auxiliary capacity electrode 61 is formed with a polish recon thin film, and is in contact with the pixel electrode 151. Moreover, the auxiliary capacity line 52 is formed with the gate electrode 114 and the same ingredient as the scanning line Y of one.
[0020] These array substrates 100 and the opposite substrate 200 are stuck by the sealant 106 where a predetermined gap is formed with the pillar-shaped spacer which is not illustrated. The liquid crystal layer 300 is enclosed with the predetermined gap formed between this array substrate 100 and the opposite substrate 200.
[0021] Next, the manufacture approach of this liquid crystal display is explained. Here, the case of the so-called multiple picking method which forms simultaneously two or more liquid crystal display panels from the large-sized mother glass substrate of a couple is explained.
[0022] First, two or more array substrates 100 are formed in a large-sized mother glass substrate. That is, on a mother glass substrate with a thickness of 0.7mm, membrane formation and patterning of a metal membrane or an insulator layer are repeated, and the semi-conductor layer and the scanning line, gate electrode [of one], gate-dielectric-film, interlayer insulation film and source electrode, signal-line [of one] and drain electrode, passivation film, light filter layer, pixel electrode, pillar-shaped spacer, and orientation film etc. is formed in order. [which consist of a polish recon thin film]
[0023] Then, two or more opposite substrates 200 corresponding to the number of array substrates are formed in a large-sized mother glass substrate. That is, on a mother glass substrate with a thickness of 0.7mm, membrane formation and patterning of a metal membrane or an insulator layer are repeated, and a counterelectrode and the orientation film are formed in order.
[0024] Then, printing spreading of the sealant 106 which becomes the mother glass substrate in which the array substrate 100 was formed from adhesives is carried out. At this time, a sealant is applied in the shape of [which surrounds the liquid crystal restoration field for being filled up with a liquid crystal constituent] a loop formation.
[0025] For example, in mother glass substrate (1st substrate) 400M in which array substrate 100 was formed top, as shown in (a) of drawing 3 , a sealant 106 is applied in the shape of a loop formation so that the liquid crystal restoration field 402 corresponding to the viewing area of each array substrate 100 may be surrounded.
[0026] Then, as shown in (b) of drawing 3 , the liquid crystal constituent 500 is dropped at the liquid crystal restoration field 402 of the inside surrounded by the sealant 106. At this time, the amount of the liquid crystal constituent 500 dropped is more than the volume of a liquid crystal restoration field when the cel gap between the substrates of a couple becomes predetermined spacing, and is usually almost equal to the volume of a liquid crystal restoration field.
[0027] Then, as shown in (c) of drawing 3 , after arranging mother glass substrate 400M in which the array substrate 100 was formed in the vacuum chamber, it arranges in piles so that each orientation film may counter after that, mother glass substrate 400M, and mother glass substrate 600M (the 2nd substrate) in which the opposite substrate was formed, by exhausting and considering as a vacua, and so that each direction of rubbing may become 90 degrees.
[0028] Then, as shown in (d) of drawing 3 , by carrying out atmospheric-air disconnection of the inside of a vacuum chamber, atmospheric pressure is applied to the mother glass substrates 400M and 600M of a couple, and homogeneity is pressurized. The pillar-shaped spacer which has predetermined height is formed in the liquid crystal restoration field 402 of the array substrate 100. Therefore, by holding the cel gap by the pillar-shaped spacer at homogeneity, the mother

glass substrates 400M and 600M of a couple are pressurized until it becomes desired spacing. At this time, a sealant 106 is not hardened thoroughly, but it is crushed until it becomes a desired cel gap by pressurizing the substrate of a couple.
[0029] Then, after the cel gap of the mother glass substrates 400M and 600M of a couple has been crushed by desired spacing, ultraviolet rays are irradiated selectively at a sealant part, and a sealant 106 is hardened by heating both substrates at 120 degrees C further for about 1 hour. This sticks the mother glass substrates 400M and 600M of a couple.
[0030] Then, as shown in (e) of drawing 3 , two or more liquid crystal display panels 10 are cut down from the mother glass substrates 400M and 600M of a couple.
[0031] Finally, a polarizing plate is stuck on the outside surface of the liquid crystal display panel 10, i.e., the front face of the array substrate 100, and the front face of the opposite substrate 200, respectively, and a liquid crystal display is manufactured.
[0032] According to the gestalt of operation mentioned above, the time amount required in order to enclose a liquid crystal constituent can be shortened substantially, and it becomes possible to reduce a manufacturing cost.
[0033] By the way, as for the sealant 106 applied to such a manufacture approach, it is desirable to adjust the solubility to a liquid crystal constituent to 100 ppm or less in order to contact the liquid crystal constituent 500 dropped before hardening thoroughly. This sealant 106 is for example, ultraviolet-rays hardening resin, and is adjusted as follows.
[0034] First, the bisphenol A mold epoxy resin partial methacrylic ghost which is the component a of a sealant is compounded by the approach shown in the following synthetic example. That is, the 1000 weight sections, the methacrylic-acid:250 weight section, the toluene:900 weight section, the triethylamine:2 weight section, and the PARAMETOKISHI phenol:2 weight section were mixed, heating stirring of high grade bisphenol A mold epoxy resin:Epicion-850S (Dainippon Ink & Chemicals make) was carried out at 90 degrees C for 8 hours, and the partial addition reaction object was compounded.
[0035] It put, and moisture was separated and removed, after having added and diluted the toluene:4500 weight section to this reactant, adding the pure-water:4500 weight section to this and stirring at a room temperature for 1 hour. After having repeated this washing actuation 5 times, repeating washing by 1 convention sodium-hydroxide water solution of tales doses 5 times continuously and repeating washing only by the pure water of tales doses 5 times further, this solution was filtered, it condensed at 70 degrees C under reduced pressure, toluene was removed thoroughly, and the bisphenol A mold epoxy resin partial methacrylic ghost was refined.
[0036] the purification processing same about other components b and f of a sealant -- carrying out -- high-grade-izing -- the bottom.
[0037] The sealant mixed and created the component of the following a thru/or f by the predetermined presentation ratio.
[0038] a component: -- bisphenol A mold epoxy resin partial methacrylic ghost: refined in the above-mentioned synthetic example -- 58 weight sections b component: -- BPE4(Dai-Ichi Kogyo Seiyaku make):5 weight section c component: -- S cure KIP-150(ram bar tee company make):4 weight section d component: -- friend KYUA VDH The component of a of these thru/or f is fully kneaded using a paint roll. (Ajinomoto make) :10 weight section e component: -- EKUSUOTSU M-2010(product made from Nippon Steel chemistry):24 weight section f component: -- the KBM-403(product made from Shin-etsu chemistry):1 weight section -- The sealant (A) of about 500,000 centipoises viscosity was produced.
[0039] Next, the solubility to the liquid crystal constituent of this sealant (A) was measured. In addition, ZLI-4792:Merck Co. make was used as a liquid crystal constituent here.
[0040] That is, after putting in and closing a sealant (A) and putting [a sealant] 4.5g for 0.5g and a liquid crystal constituent gently at 23 degrees C on ampul tubing for 24 hours, the amount of dissolutions of each component of a sealant was added together for the supernatant of a liquid crystal constituent in it using ejection and a gas-chromatography analysis apparatus (14A, Shimadzu make), and solubility was measured in it. Consequently, the solubility to the liquid crystal constituent of a sealant (A) mentioned above was 90 ppm.
[0041] Next, this sealant (A) was used, the liquid crystal display was produced by the

manufacture approach mentioned above, and the existence of a poor display was examined. According to this liquid crystal display, there is no poor display, such as air bubbles, white ZUMI, and printing, and good display grace was able to be realized. Moreover, when the cel for electrical-potential-difference retention measurement was produced by the same approach and electrical-potential-difference retention was measured, it was as good as 99%.

[0042] (Example of a comparison) the component b of the sealant in the gestalt of operation mentioned above -- bisphenol A dimethacrylate: -- the sealant (B) of about 100,000 centipoises viscosity which it considered as 5 weight sections, and also was adjusted similarly was produced. It was 300 ppm when the solubility to the liquid crystal constituent (ZLI-4792: Merck Co. make) of this sealant (B) was measured.

[0043] This sealant (B) was used, and when the liquid crystal display was produced by the manufacture approach which was mentioned above, white ZUMI and the poor display of printing were generated in the screen. Moreover, it was 89% when electrical-potential-difference retention was measured.

[0044] Similarly, as a result of experimenting by various sealants, the poor display occurred with the liquid crystal display using the sealant to which solubility exceeds 100 ppm.

[0045] According to the sealant applied to the manufacture approach of such a liquid crystal display, and this liquid crystal display, in the dropping pouring-in method which can shorten the enclosure time amount of a liquid crystal constituent, the sealant before hardening with a possibility of contacting a liquid crystal constituent is adjusted so that the solubility to a liquid crystal constituent may be set to 100 ppm or less. For this reason, it becomes possible for the sealant to a liquid crystal constituent to melt and to stop ****, and contamination of a liquid crystal constituent can be prevented. This becomes possible to prevent generating of a poor display.

[0046] Moreover, since it is not necessary to harden a sealant before pressurizing so that it may consider as the cel gap of a request of a liquid crystal layer, also when the substrate of a couple is pressurized, a sealant tends to be crushed, and it becomes possible to secure a desired cel gap easily.

[0047] It becomes possible to be stabilized and to mass-produce the good liquid crystal display of display grace by this.

[0048] In addition, that this invention should just use the sealant whose solubility to the liquid crystal constituent in the condition before hardening is 100 ppm or less, the sealant itself may be heat-curing mold resin, or it may be ultraviolet curing mold resin.

[0049] Moreover, the spreading pattern of a sealant does not need to be a loop formation-like, and especially the existence of the dummy pattern of the sake on the existence of an air discharge hole and a liquid crystal discharge hole and a gap flat disposition etc. does not ask.

[0050] Furthermore, ****** [the superposition of a substrate] under a vacuum or ordinary pressure.

[0051] Moreover, with the gestalt of operation mentioned above, although the sealant was applied to the mother glass substrate in which the array substrate was formed, it may be applied to the mother glass substrate in which the opposite substrate was formed, and may be applied to both substrates.

[0052]

[Effect of the Invention] As explained above, according to this invention, the sealant applied to the manufacture approach of the liquid crystal display which it is stabilized and can mass-produce the good liquid crystal display of display grace possible [enclosing a liquid crystal constituent] for a short time, and this liquid crystal display can be offered.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing 1 is the perspective view showing roughly the configuration of the liquid crystal display panel manufactured by the manufacture approach of the liquid crystal display this invention.
[Drawing 2] Drawing 2 is the circuit diagram showing roughly the configuration of the liquid crystal display panel shown in drawing 1 .
[Drawing 3] (a) of drawing 3 thru/or (e) are the sectional views for explaining an example of the manufacture approach of the liquid crystal display of this invention.
[Description of Notations]
100 -- Array substrate
200 -- Opposite substrate
300 -- Liquid crystal constituent (liquid crystal layer)
400M -- Mother glass substrate (for array substrates)
402 -- Liquid crystal restoration field
500 -- Liquid crystal constituent
600M -- Mother glass substrate (for opposite substrates)

[Translation done.]